AIR BARRIERS AN EMERGING MARKET
ASHRAE 90.1 NEW 2007 INSULATION REQUIREMENTS

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STATE OF CT
HOUSE BILL 7432

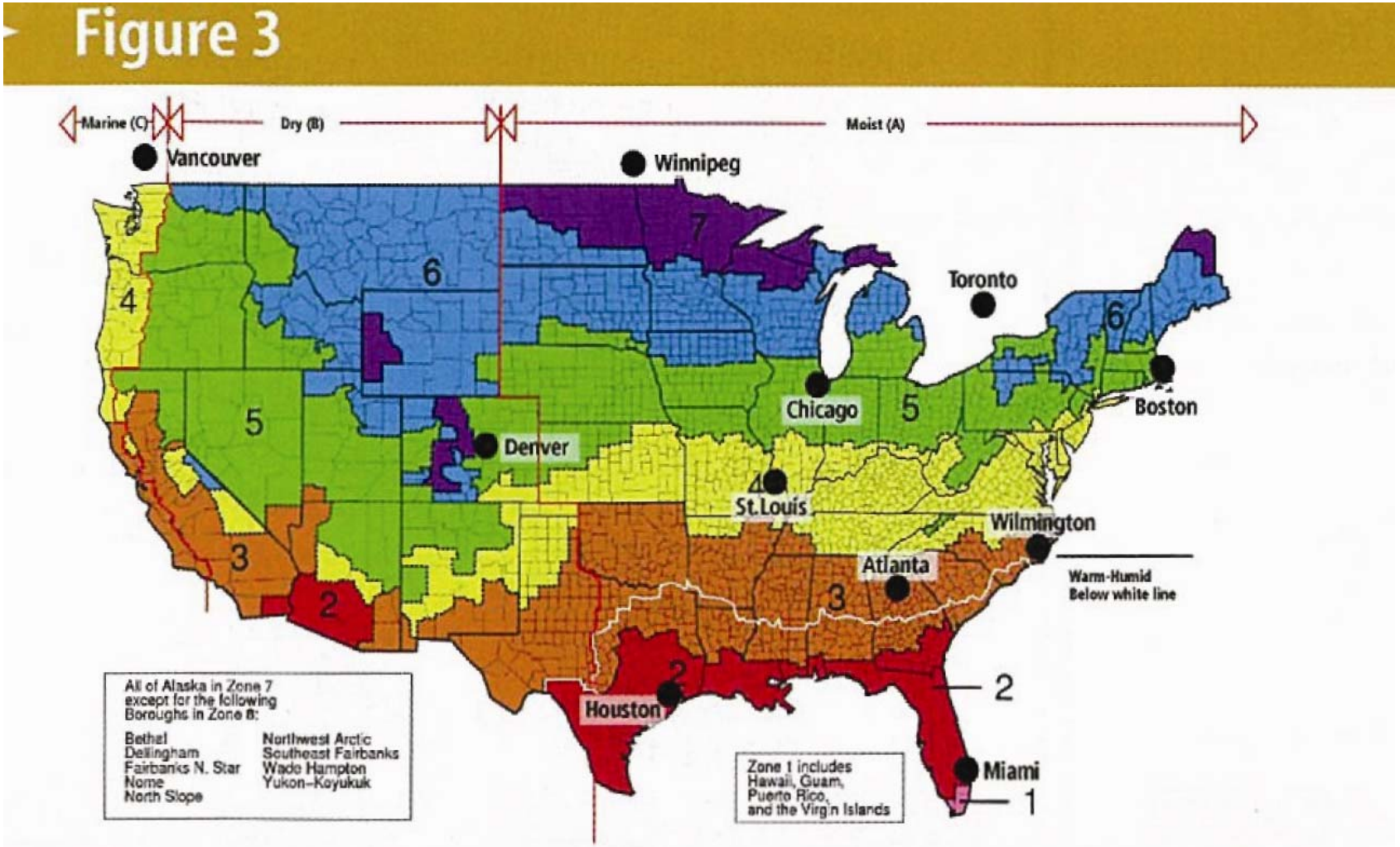
- Sec. 78. Section 29-256a of the general statutes is repealed and the following is substituted in lieu thereof (*Effective October 1, 2007*):
- **[**The**]** (a) On and after January 1, 2008, the State Building Inspector and the Codes and Standards Committee shall revise the State Building Code to require that buildings and building elements, including residential, be designed to provide optimum cost-effective energy efficiency over the useful life of the building. Such revision shall meet the American Society of Heating, Refrigerating and Air Conditioning Engineers Standard 90. 1 for new construction.

WHO IS ASHRAE

ASHRAE Society Profile

ASHRAE, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, is an international organization of over 50,000 persons with chapters throughout the world. The Society is organized for the sole purpose of advancing the arts and sciences of heating, ventilation, air conditioning and refrigeration for the public's benefit through research, standards writing, continuing education and publications.

ASHARE 90.1 2007 NEW INSULATION REQUIREMENTS



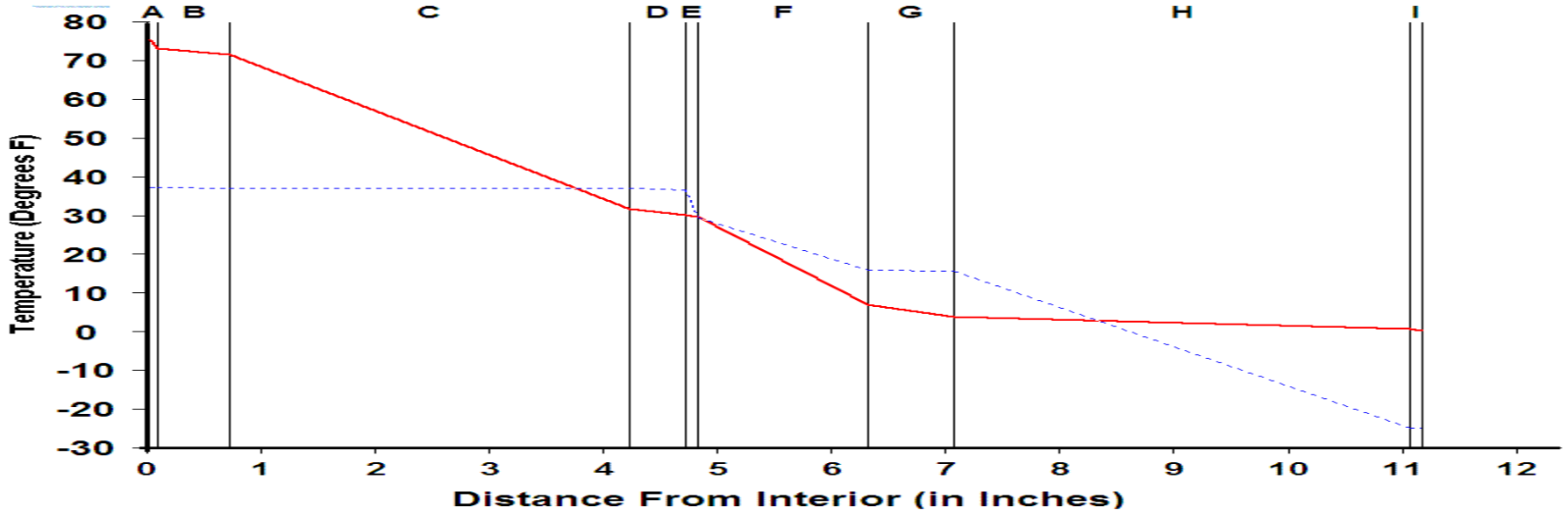
CLIMATE ZONE 5 MA AND SOUTH TO NORTH NJ

Table 5 Proposed Building Envelope Changes for Climate Zone 5 (up to Chicago)

		Non-residential		Residential		Semi-heated	
	Opaque Elements	**Current**	***Proposed***	**Current**	***Proposed***	**Current**	***Proposed***
Roofs							
	Insulation Entirely Above Deck	R-15ci	***R-20ci***	R-15ci	***R-20ci***	R-5ci	***R-7.6ci***
	Metal Buildings	R-19	***R-13 + R-13***	R-19	***R-13 + R-13***	R-10	***R-13***
	Attic and Other	R-30	***R-38***	R-38	NC	R-19	NC
Walls, Above Grade							
	Mass	R-7.6ci	***R-11.4ci***	R-11.4ci	***R-13.3ci***	NR	***R-5.7ci***
	Metal Building	R-13	***R-13 + R-13***	R-13 + R-13	***R-13 + R-13***	R-11	***R-13***
	Steel Framed	R-13 + R-3.8ci	***R-13 + R-7.5ci***	R-13 + R-7.5ci	NC	R-13	NC
	Wood Framed and Other	R-13	***R-13 + R-3.8ci***	R-13	***R-13 + R-7.5ci***	R-13	NC

Dewpoint Analysis - Dow Chemical

ASHRAE 90.1 2007 WALL



Legend
Actual Temperature
Dewpoint Temperature

Dewpoint Theory predicts condensation in a system at any point where the actual and dewpoint temperature lines cross.

Conditions:	Interior	Exterior
Temperature	75.0	0.0
Humidity	25.0	25.0

	Component Name	Thickness	R-Value	Rep
A	Interior Air Film	0.100	0.68	0.001
B	Drywall .625in	0.625	0.56	0.023
C	R-13 Fiberglass Batt	3.500	13.00	0.010
D	DENS-GLASS GOLD .5in	0.500	0.56	0.043
E	Asphalt Felt 15#	0.100	0.10	1.000
F	CAVITYMATE Insulation	1.500	7.50	1.350
G	Wall Air Space NonRefl	0.750	1.01	0.006
H	Brick Common 4in	4.000	1.00	1.300
I	Outside Air Film Winter	0.100	0.17	0.001
J				
K				
L				
	TOTAL	11.175	24.58	3.734

Interface	Temperature Actual	Temperature Dewpnt	Accum (oz/day-sqft)
-A	75.00	36.94	0.000
AB	72.93	36.94	0.000
BC	71.22	36.79	0.000
CD	31.55	36.73	* 0.067
DE	29.84	36.45	* 0.037
EF	29.54	29.18	0.000
FG	6.65	15.54	* 0.002
GH	3.57	15.45	* 0.002
HI	0.52	-25.10	0.000
IJ	0.00	-25.19	0.000
JK			
KL			
L-			

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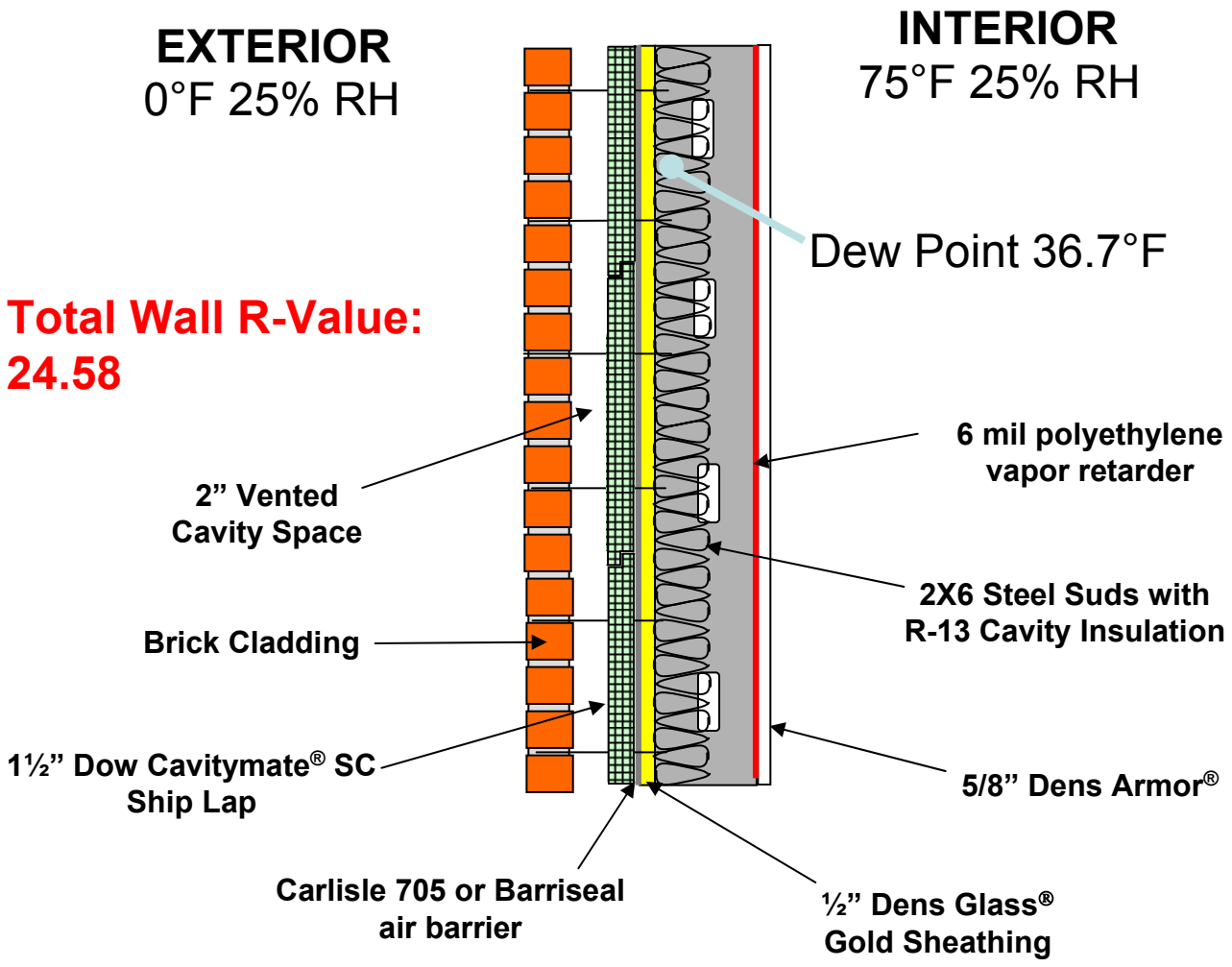
ASHRAE 90.1 2007 ZONE 5
Cavity Wall, R-13 + R-5.7 ci



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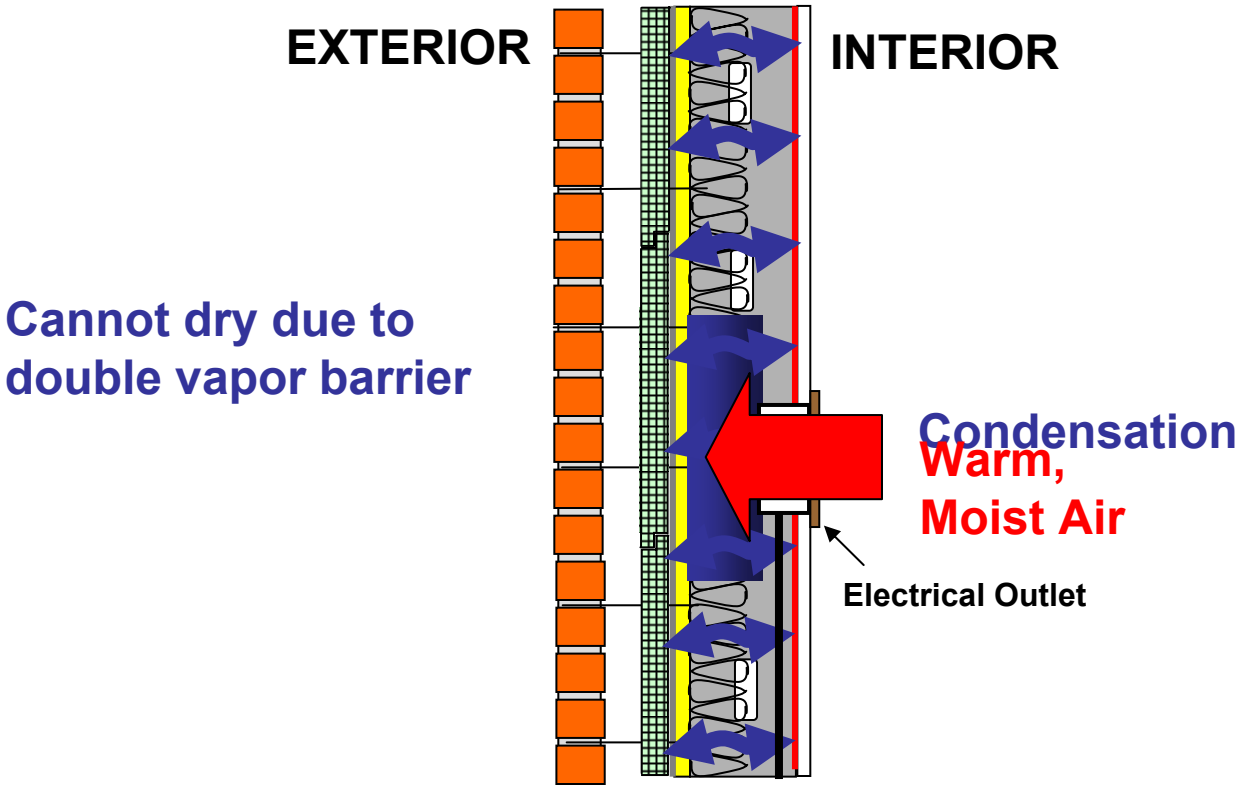
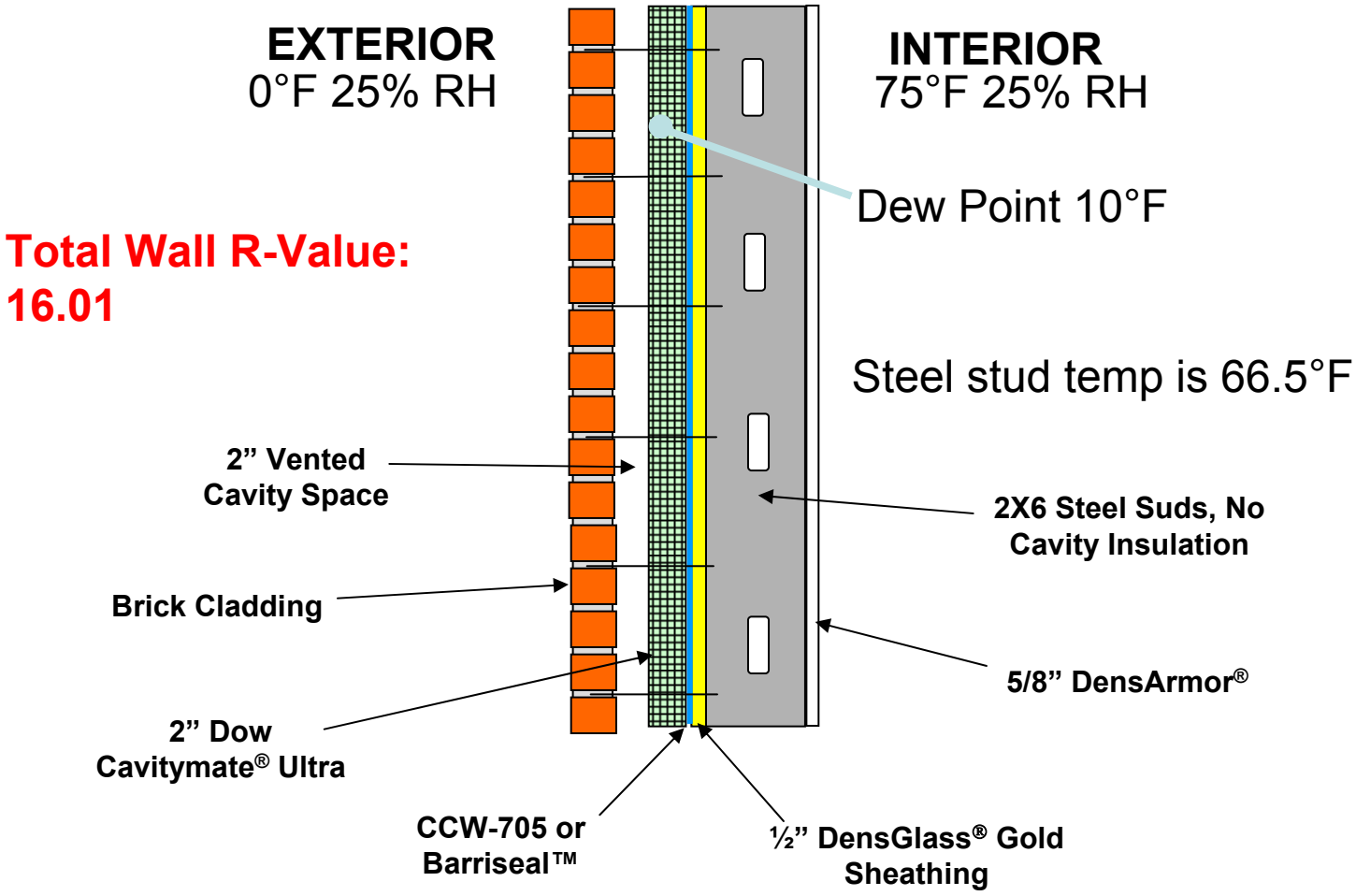


BEST PRATICE WALL
Cavity Wall, 0 + R-12 ci
Air & Vapor Barrier + Exterior Insulation



AIR BARRIERS AN EMERGING MARKET

- What is driving the market?

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  - States like MA adopting air barriers back in 2000
  - ASHRAE 90.1-2008 adopting air barriers standards for 2008

UNDERSTANDING BUILDING SCIENCE

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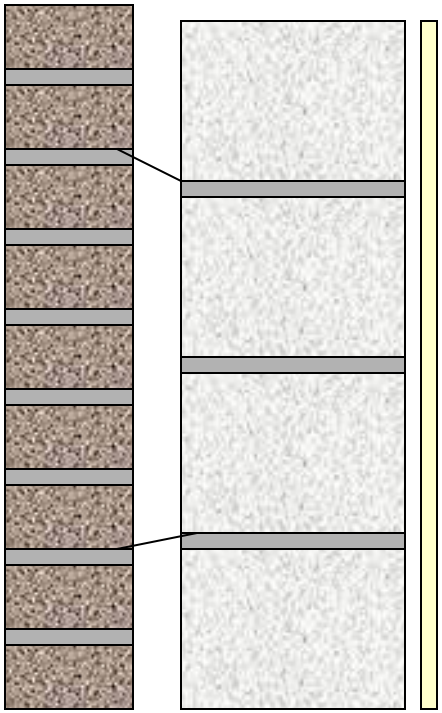
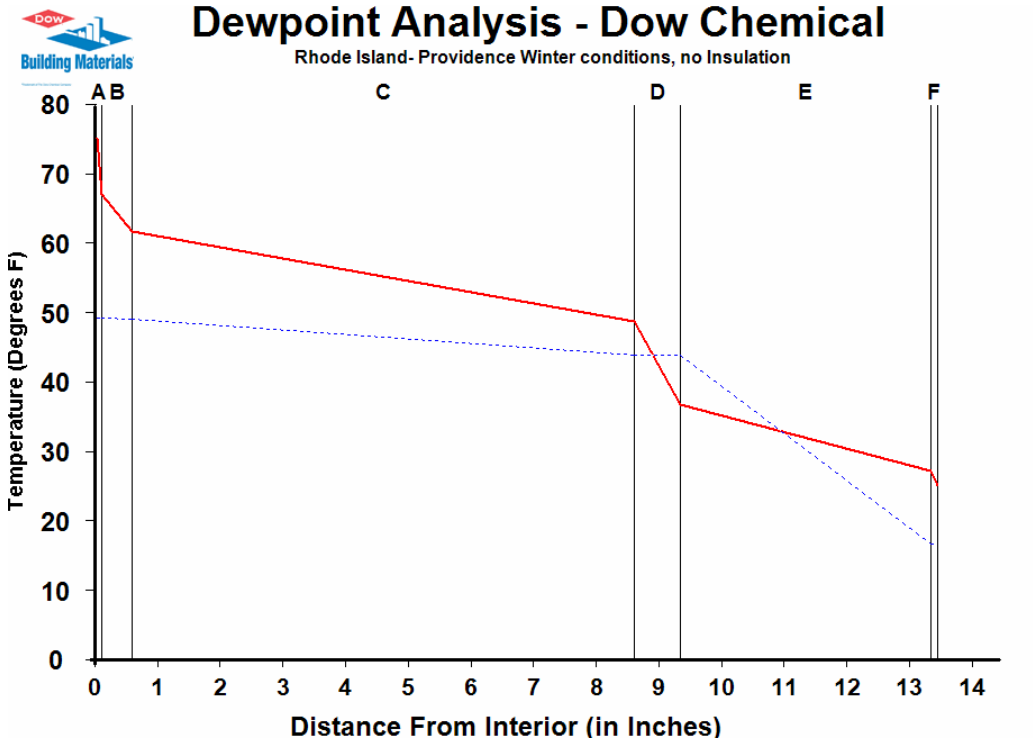
- How did we use to build walls 100 years ago?

UNDERSTANDING BUILDING SCIENCE

- How did we use to build walls 100 years ago?
- They were not energy efficient but they also did not have mold issues for the most part.

Masonry Wall without insulation





UNDERSTANDING BUILDING SCIENCE

UNDERSTANDING BUILDING SCIENCE

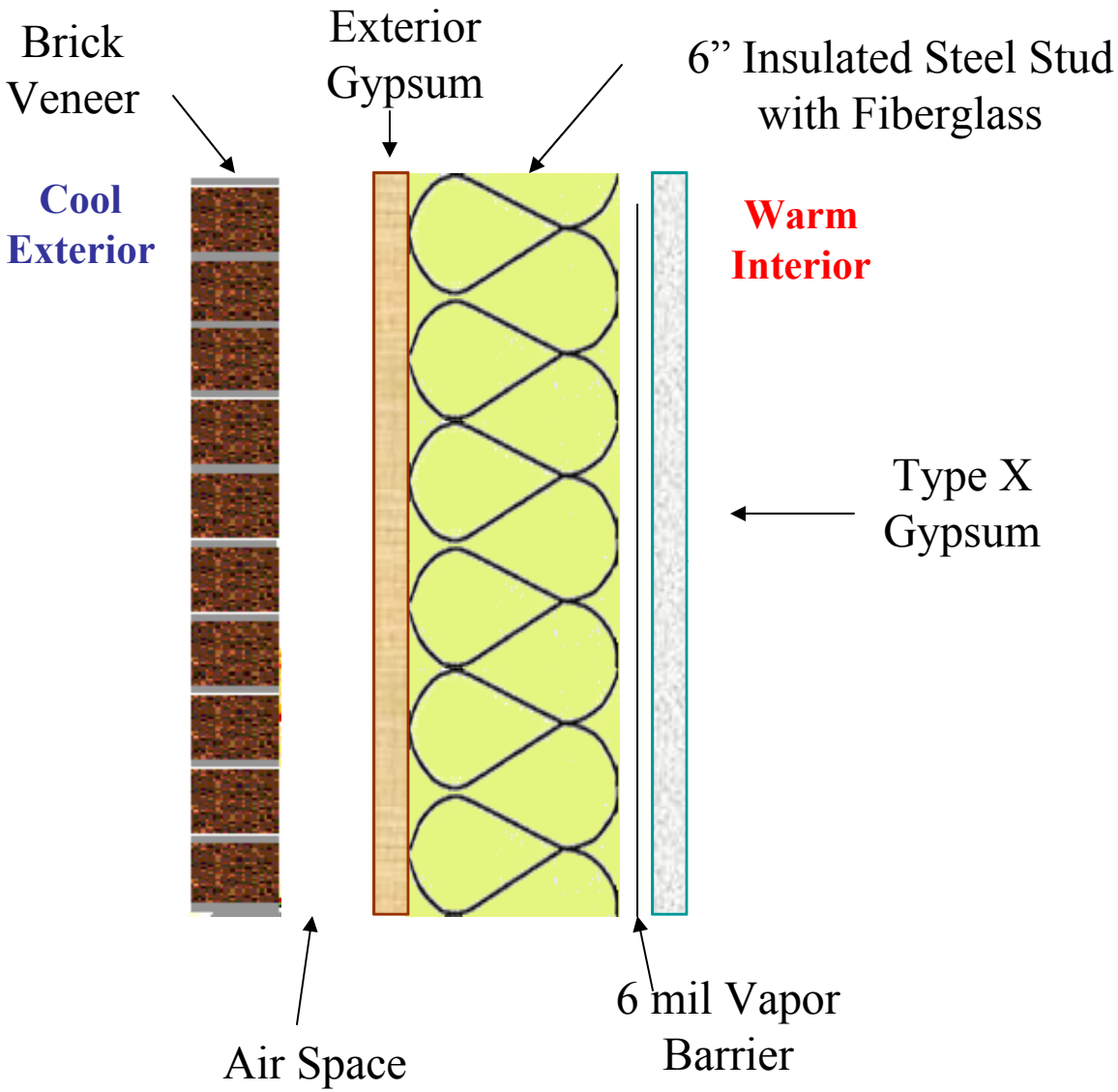
- How have we built walls over the last 20 years?

UNDERSTANDING BUILDING SCIENCE

- How have we built walls over the last 20 years?
- We added insulation, vapor barriers, and got rid of the mass and lightened the wall

Wall Design

Typical Wall Design



Wall Design

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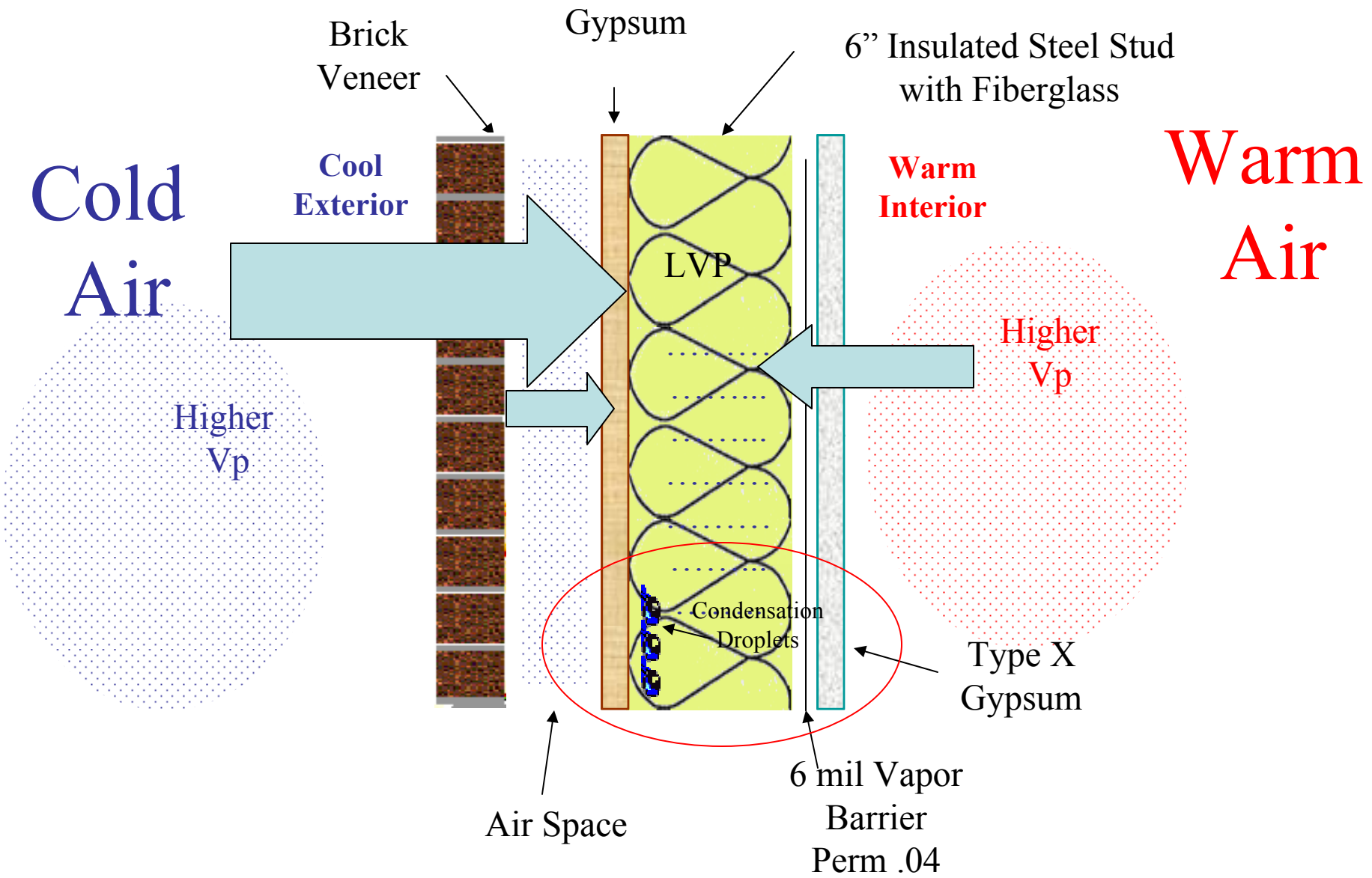
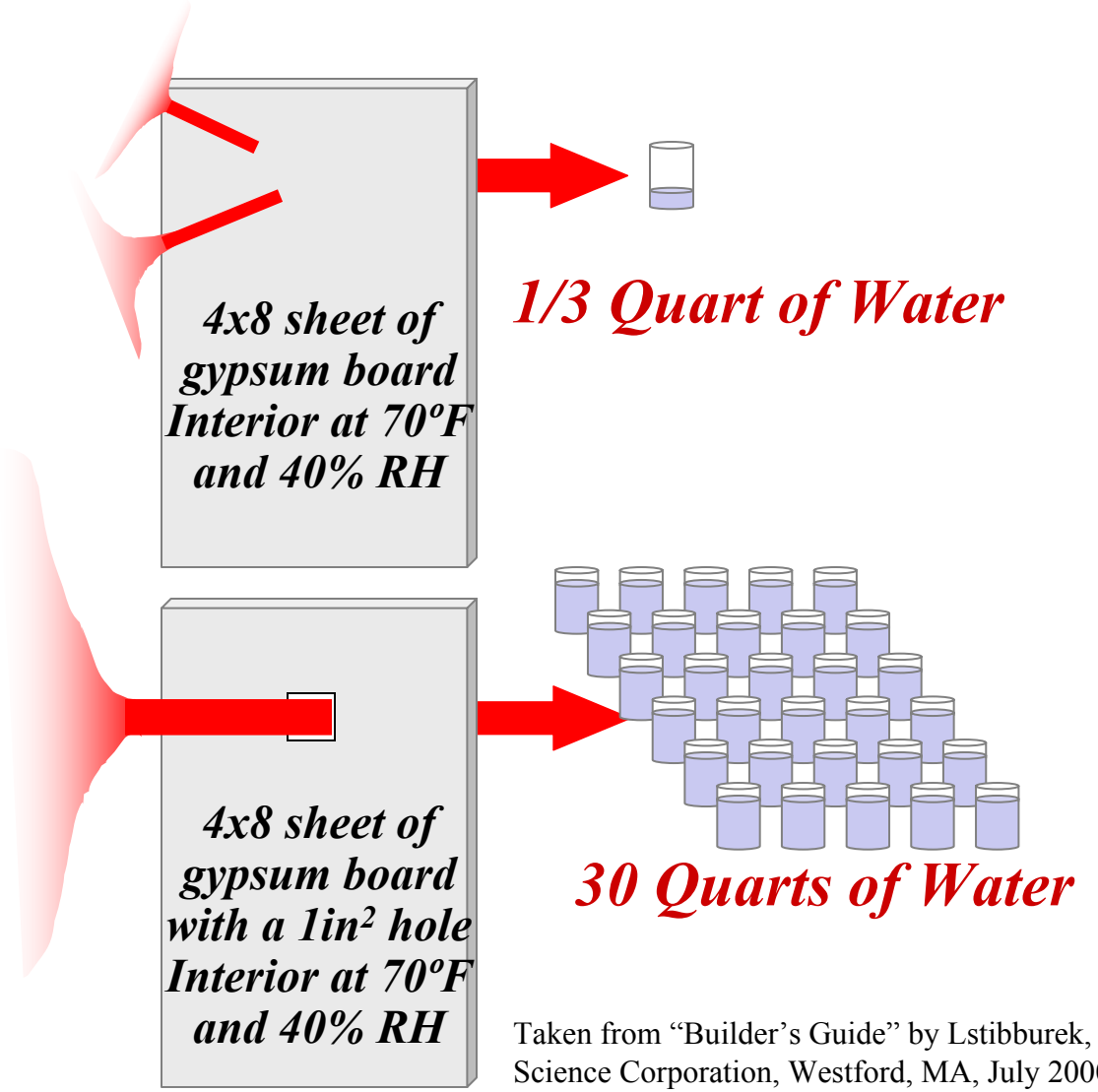


Moisture Drive



Vapor Diffusion

Air Exfiltration / Infiltration

Taken from "Builder's Guide" by Lstibburek, Joseph of Building Science Corporation, Westford, MA, July 2000.

Moisture Drive

Moisture in Wall Assemblies

- You don't want this to occur !

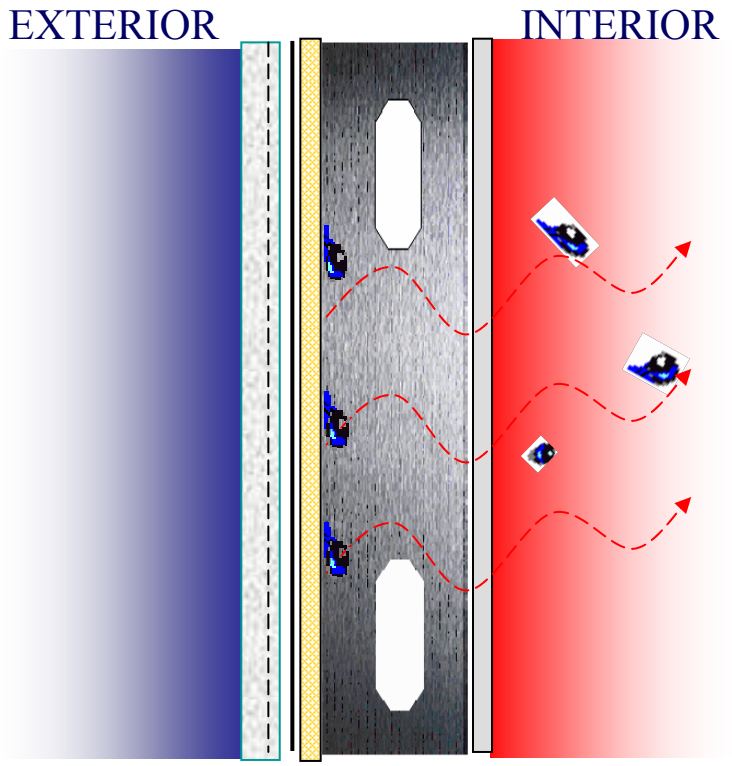
How do you build a wall correctly with air barriers in all climates?

How do you build a wall correctly with air barriers in all climates?

- There needs to be an understanding of:
  - Air barrier placement in the wall
  - Insulation
  - Vapor barrier requirement

Wall Design

- **Building Science** experts recommend the exterior of the wall be built as tight as possible in **Severe Cold**, **Cold, Hot, and Mixed Humid** Climates.
- Leave the inside permeable enough to dry.
- To do this:
  - **First**, take the fiberglass insulation/interior vapor retarder out of the wall cavity and use insulated sheathing on the exterior.



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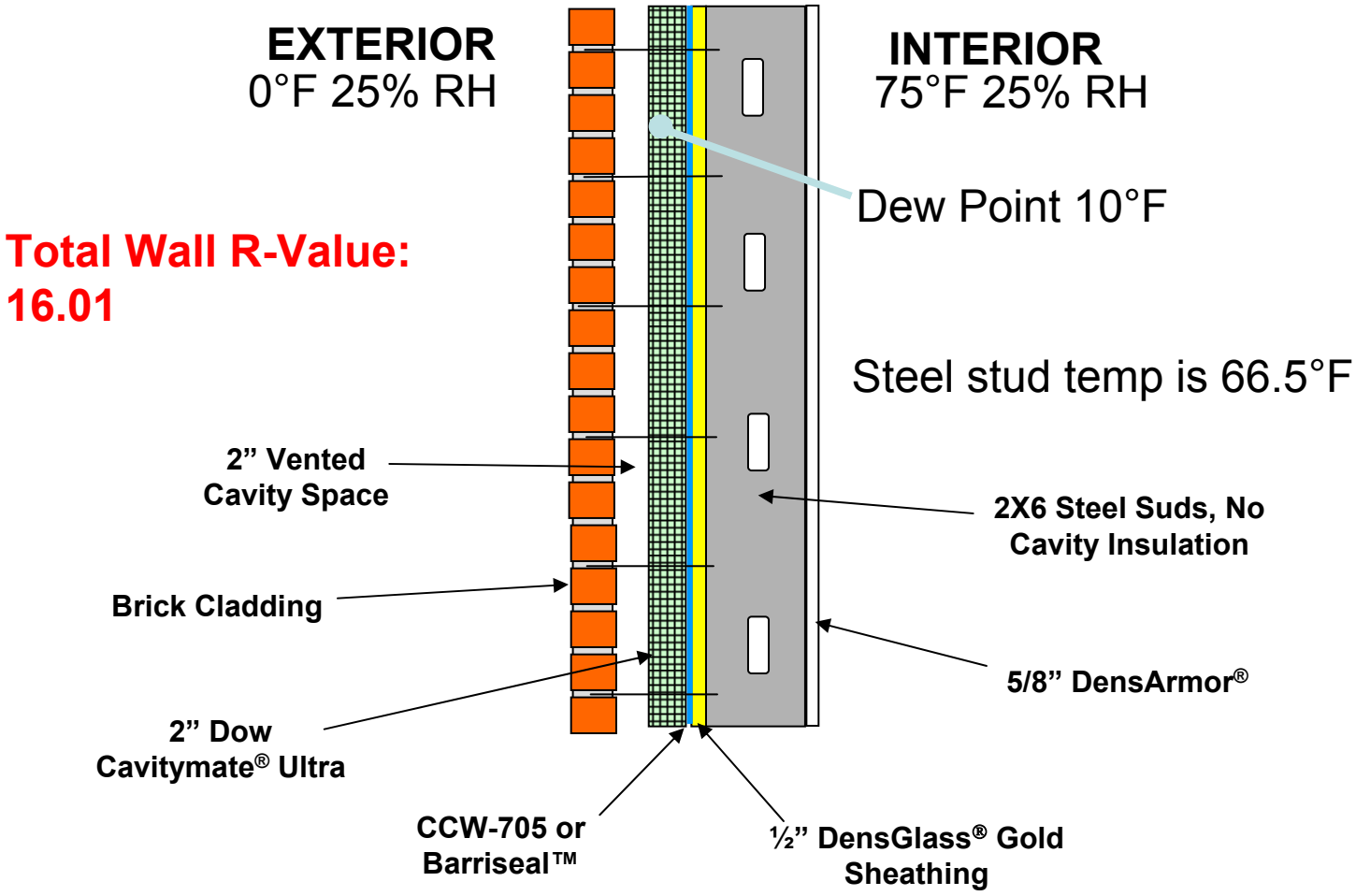

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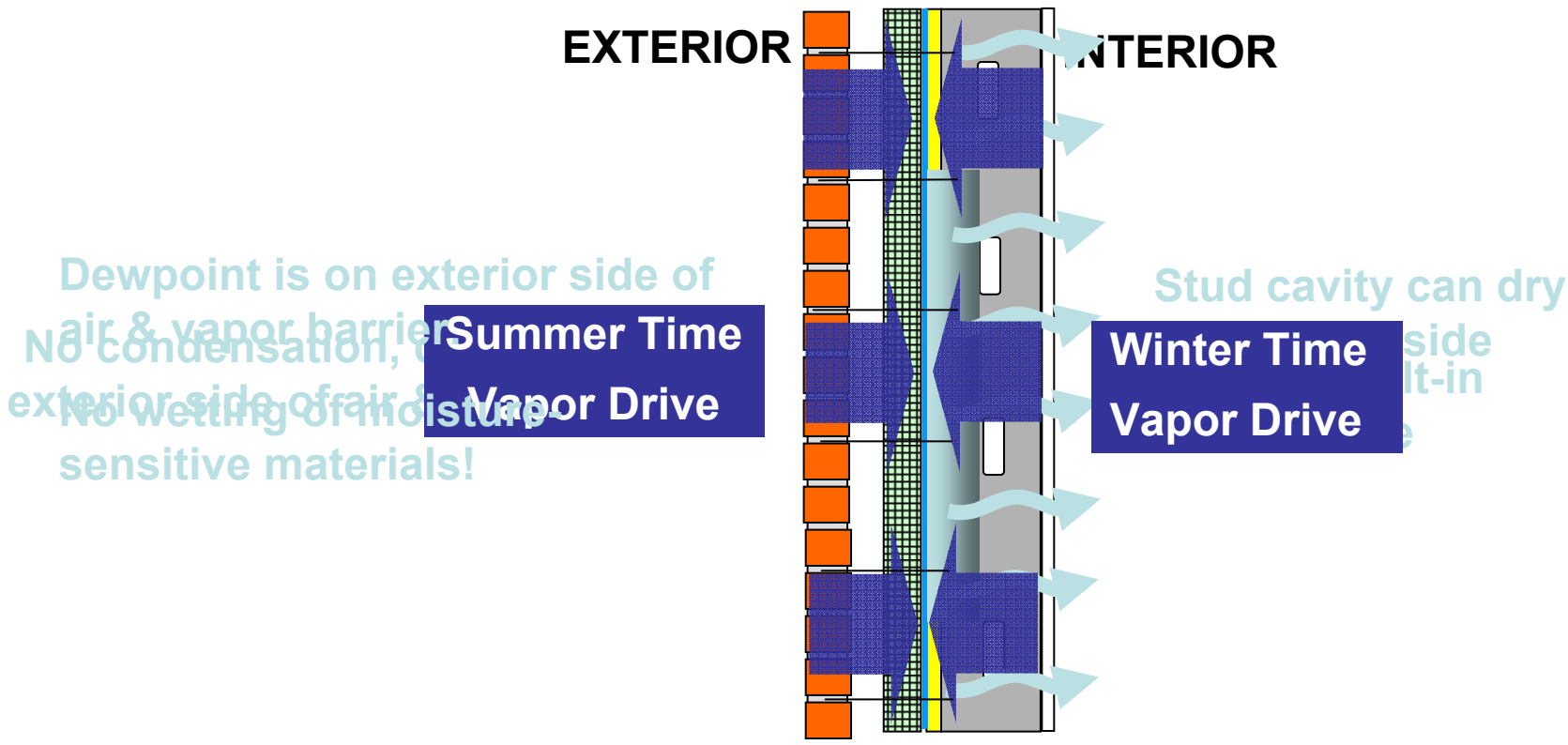
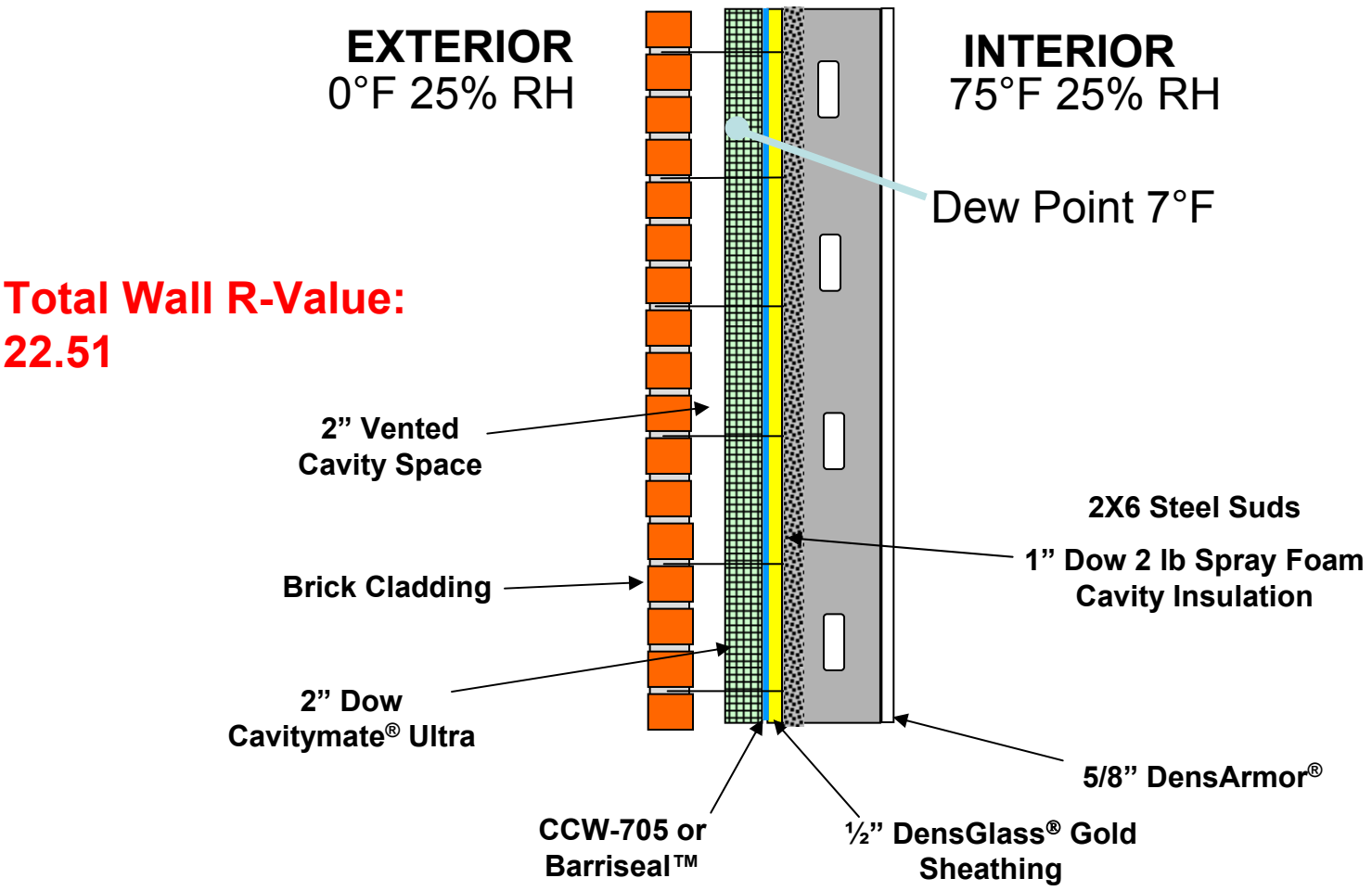


54% IMPROVED WALL R- 22.51



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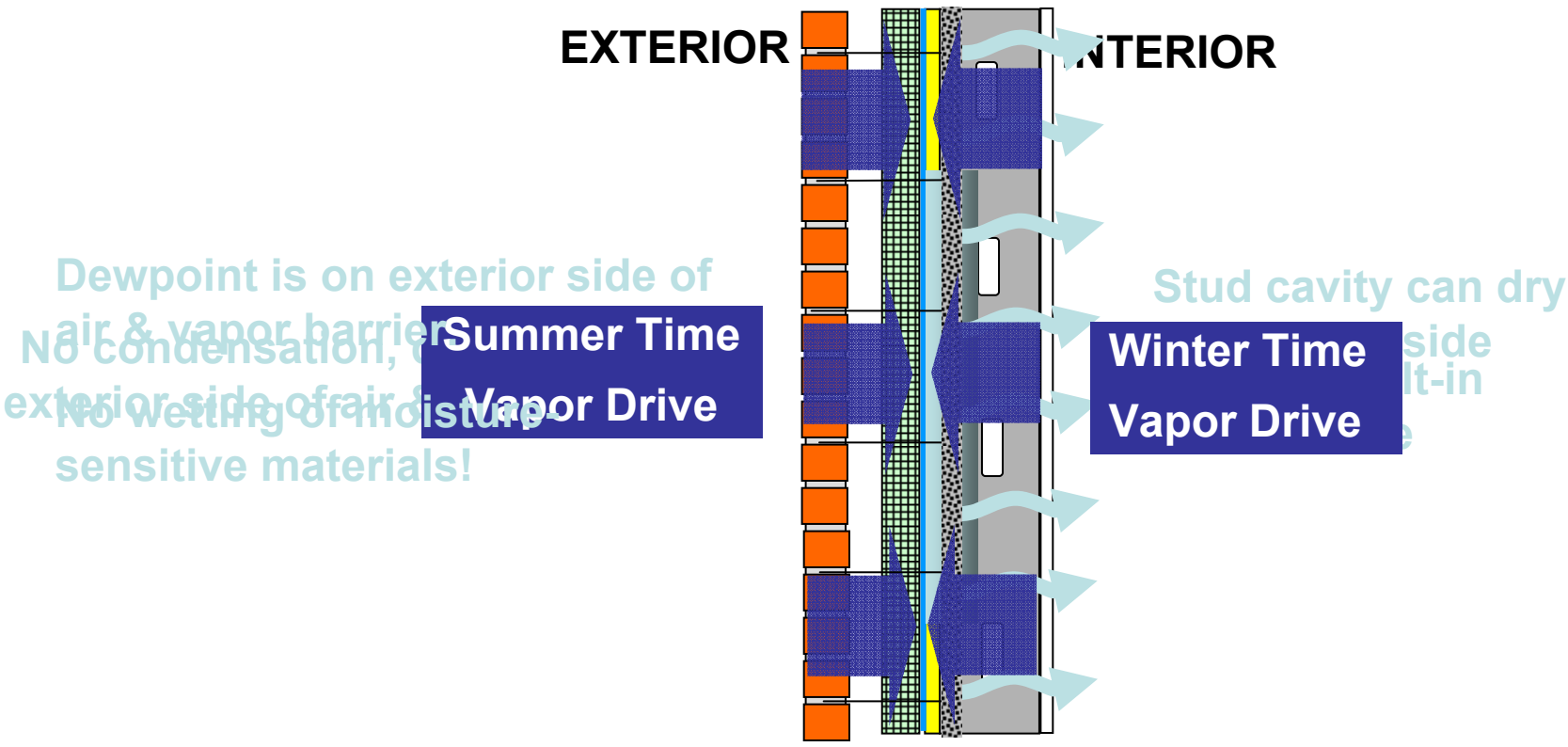

Sample Details

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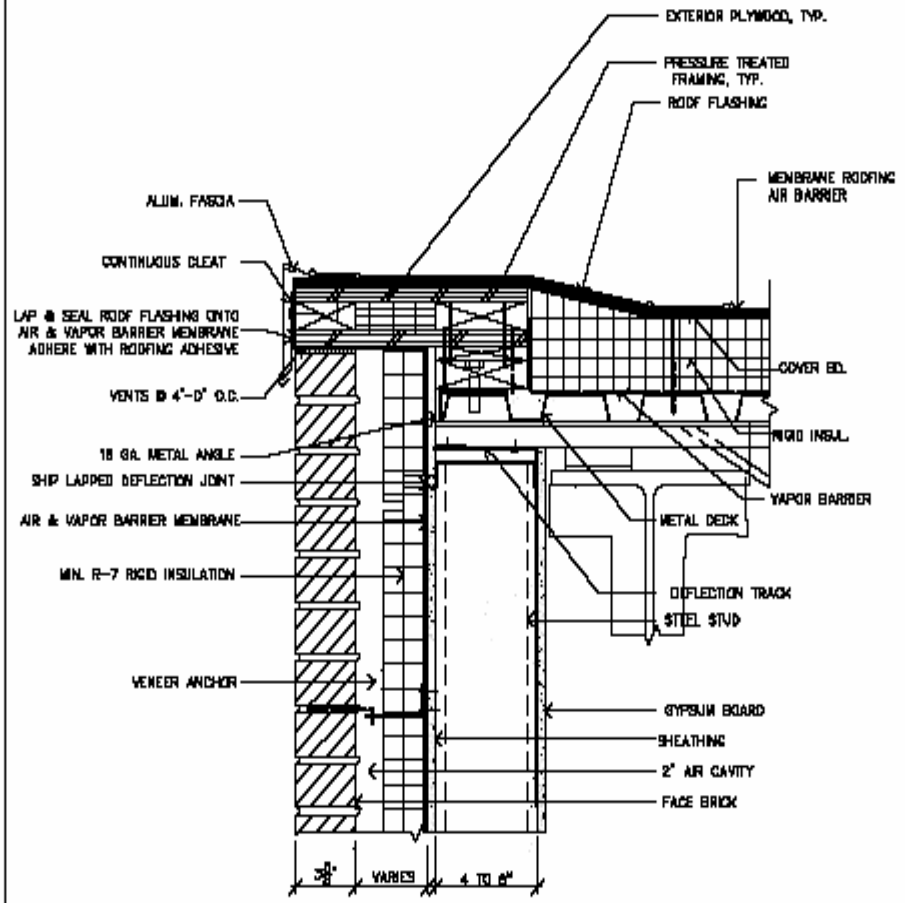
EXTERIOR PLYWOOD, TYP.
PRESSURE TREATED FRAMING, TYP.
ROOF FLASHING
MEMBRANE ROOFING AIR BARRIER
ALUM. FASCIA
CONTINUOUS CLEAT
LAP & SEAL ROOF FLASHING ONTO AIR & VAPOR BARRIER MEMBRANE ADHERE WITH ROOFING ADHESIVE
VENTS @ 4'-0" O.C.
COVER BD.
RIGID INSUL.
18 GA. METAL ANGLE
SHIP LAPPED DEFLECTION JOINT
AIR & VAPOR BARRIER MEMBRANE
VAPOR BARRIER
METAL DECK
MIN. R-7 RIGID INSULATION
DEFLECTION TRACK
STEEL STUD
VENEER ANCHOR
GYPSUM BOARD
SHEATHING
2" AIR CAVITY
FACE BRICK
VARIES
4 TO 6"

Thermal Break

- Effective R-value = R-value x Correction Factor

Nominal Framing Depth	Nominal Insulation R-Value	Correction Factor	Effective R-Value
4" @ 16" o.c.	R-11	0.50	R-5.5
	R-13	0.46	R-6.0
	R-15	0.43	R-6.4
4" @ 24" o.c.	R-11	0.60	R-6.6
	R-13	0.55	R-7.2
	R-15	0.52	R-7.8
6" @ 16" o.c.	R-19	0.40	R-7.6[2]
	R-21	0.35	R-7.4
6" @ 24 o.c.	R-19	0.45	R-8.6
	R-21	0.43	R-9.0

[1]Data source: Adopted from ASHRAE/IES Standard 90.1-1989 User's Manual, November 1992, p. 8-64.
[2]Recent analysis of tested assemblies indicates an R-value of 7.1 for R-19 insulation in nominal 6" framing at 16" on center, though the correction factor published in Standard 90.1 currently offers a higher credit

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WHY ASHRAE 90.1 2008 IS ADOPTING AIR BARRIERS

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- US Department of Energy sponsored study on air barriers by National Institute of Standards and Technology (NIST) June 2005

NISTIR 7238

Investigation of the Impact of Commercial Building Envelope Airtightness on HVAC Energy Use

Steven J. Emmerich
Building and Fire Research Laboratory

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Shepley Bulfinch Richardson and Abbott

Prepared for:
U.S. Department of Energy
Office of Building Technologies

June 2005

U.S. Department of Commerce
Carlos M. Gutierrez, *Secretary*
Technology Administration
Phillip J. Bond, *Under Secretary of Commerce for Technology*
National Institute of Standards and Technology
Hratch Semerjian, *Acting Director*

ABSTRACT

This report presents a simulation study of the energy impact of improving envelope airtightness in U.S. commercial buildings. Despite common assumptions, measurements have shown that typical U.S. commercial buildings are not particularly airtight. Past simulation studies have shown that commercial building envelope leakage can result in significant heating and cooling loads. To evaluate the potential energy savings of an effective air barrier requirement, annual energy simulations were prepared for three nonresidential buildings (a two-story office building, a one-story retail building, and a four-story apartment building) in 5 U.S. cities. A coupled multizone airflow and building energy simulation tool was used to predict the energy use for the buildings at a target tightness level relative to a baseline level based on measurements in existing buildings. Based on assumed blended national average heating and cooling energy prices, predicted potential annual heating and cooling energy cost savings ranged from 3 % to 36 % with the smallest savings occurring in the cooling-dominated climates of Phoenix and Miami. In order to put these estimated energy savings in context, a cost effectiveness calculation was performed using the scalar ratio methodology employed by ASHRAE SSPC 90.1.

Full 48 page report available for down load at
www.pacerepresentatives.com

Go to "PACE NEWS"

THREE MAJOR TYPES OF AIR BARRIERS THAT WILL MEET THE PROPOSED 2007 ASHRAE REQUIREMENTS

THREE MAJOR TYPES OF AIR BARRIERS THAT WILL MEET THE PROPOSED 2008 ASHRAE REQUIREMENTS

- Sheet known as peel–and-stick
- Liquid applied
  - Roll on single component
  - Spray on multi-component

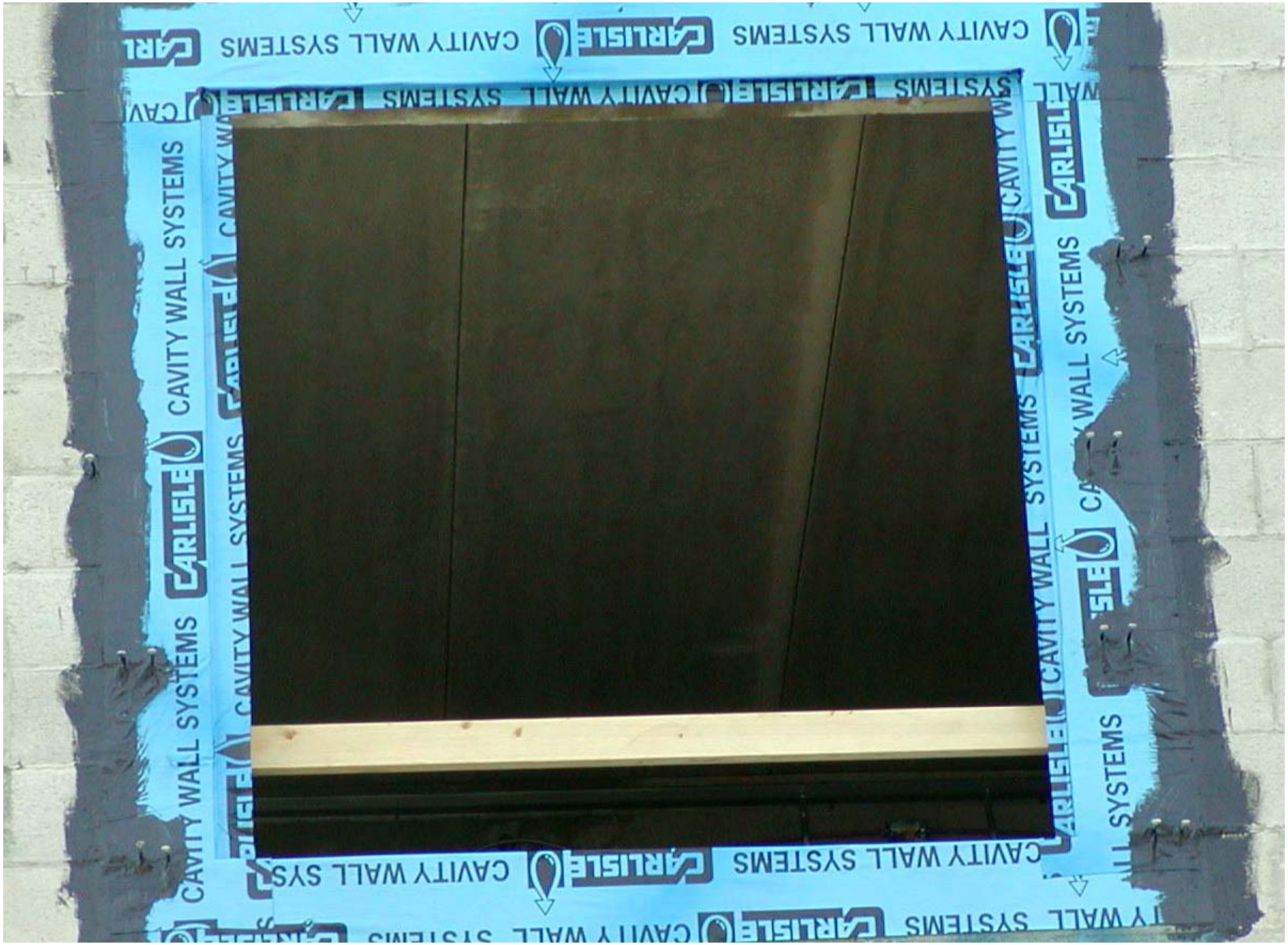
SHEET PEEL-AND-STICK


CARLISLE
CAVITY WALL SYSTEMS


Styrofoam
CARLISLE
CAVITY WALL SYSTEMS

CAVITY WALL SYSTEMS
CARLISLE

SINGLE COMPONET ROLL ON


CARLISLE
CAVITY WALL SYSTEMS

SINGLE COMPONET TROWEL ON


cific

SINGLE COMPONET SPRAY APPLIED


NO
PARKING


yrofoam

Acrobat Document

QUESTIONS